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10/606,935	06/27/2003	Takafumi Terahara	1344.1120	4453

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EXAMINER	
LI, SHI K	

ART UNIT	PAPER NUMBER
2613	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/606,935	TERAHARA ET AL.	
	Examiner	Art Unit	
	Shi K. Li	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 May 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-18,20,22 and 25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-18,20,22 and 25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. (S. Bigo et al., "Improving Spectral Efficiency by Ultra-Narrow Optical Filtering to Achieve Multi-Terabit/s Capacities", OFC 2002, 17-22 March 2002) in view of Miyamoto et al. (U.S. Patent 6,865,348 B2).

Regarding claims 1 and 17, Bigo et al. teaches in the first paragraph of the *Introduction* WDM transmission system in which signal lights with different wavelengths are multiplexed (see FIG. 1). Bigo et al. teaches in the first paragraph of Centered *filers in transmitter* demultiplexing and receivers at the receiving end. Bigo et al. teaches both NRZ and RZ signal format (see FIG. 1). Bigo et al. teaches in first paragraph of *Centered filers in transmitter* inserting centered optical filters at the transmitting end before wavelength multiplexing (see FIG. 1) for improving spectrum efficiency. The difference between Bigo et al. and the claimed invention is that Bigo et al. does not teach super-Gaussian filters. However, super-Gaussian filters are well known in the art. For example, Miyamoto et al. teach in FIG. 2B optical filter 82. Miyamoto et al. teaches in FIG. 44D and col. 30, lines 50-55 super-Gaussian filter of order m. One of ordinary skill in the art would have been motivated to combine the teaching of Miyamoto et al. with the WDM transmission system of Bigo et al. because a super-Gaussian filter with order m>1 gives high suppression ratio for crosstalk. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use super Gaussian or order m>l, as

taught by Miyamoto et al., in the transmission system of Bigo et al. because a super-Gaussian filter with order m>1 gives high suppression ratio for crosstalk.

3. Claims 3-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. and Miyamoto et al. as applied to claims 1 and 7 above, and further in view of Frankel et al. (U.S. Patent 6,496,297 B1).

Bigo et al. and Miyamoto et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al. and Miyamoto et al. and the claimed invention is that Bigo et al. and Miyamoto et al. do not teach that the spectrum efficiency is 0.574 bit/s/Hz. However, spectrum efficiency is an engineering figure which depends on many factors. For example, Frankel et al. teaches in col. 5, line 51 spectral efficiency of 0.7 bits/s/Hz and teaches in col. 5, line 59-60 that spectrum efficiency may be increased to 1 bit/s/Hz. Literature in the art teaches various spectrum efficiency values and, therefore, specifying a particular value or a particular range of values is not patentable.

Regarding claim 4, given maximum spectral efficiency 0.574 bits/s/Hz, grid I and bit rate B, it is obvious that B/(kI) is the actual spectrum efficiency and B/(kI) must be smaller than or equal to 0.574 bit/s/Hz. The smallest k such that B/(kI) < 0.574 bit/s/Hz is the minimum value for k.

Regarding claims 5 and 7, if B/I is 1.6 bit/s/Hz, k=l gives a spectral efficiency of 1.6 bit/s/Hz which is not possible, k=2 gives a spectrum efficiency of 0.6 which is also not possible while k=3 gives a spectrum efficiency of 0.53 which is less than the maximum value.

Regarding claim 6, for I of 25 GHz, frequency spacing is kI = 75 GHz.

Regarding claim 8, set Δf =75 GHz and fb = 40 to 50 GHz give their ratio as 1.875 and

1.50.

Similar arithmetic gives results of claims 9-12.

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. and Miyamoto et al. as applied to claims 1 and 17 above, and further in view of Ramaswami et al. ("Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001, pp. 139-143).

Bigo et al. and Miyamoto et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al. and Miyamoto et al. and the claimed invention is that Bigo et al. and Miyamoto et al. do not teach arrayed waveguide grating. Ramaswami et al. teaches on pp. 139-143 arrayed waveguide grating as multiplexer/demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al. with the modified WDM transmission system of Bigo et al. and Miyamoto et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to Use an arrayed waveguide grating as multiplexer/demultiplexer, as taught by Ramaswami et al., in the modified WDM transmission system of Bigo et al. and Miyamoto et al. as an engineering design choice.

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al. and Frankel et al. as applied to claims 3-12 above, and further in view of Ramaswami et al. ("Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001, pp. 139-143).

Bigo et al., Miyamoto et al. and Frankel et al. have been discussed above in regard to claims 3-12. The difference between Bigo et al., Miyamoto et al. and Frankel et al. and the

claimed invention is that Bigo et al., Miyamoto et al. and Frankel et al. do not teach arrayed waveguide grating. Ramaswami et al. teaches on pp. 139-143 arrayed waveguide grating as multiplexer/demultiplexer. One of ordinary skill in the art would have been motivated to combine the teaching of Ramaswami et al. with the modified WDM transmission system of Bigo et al., Miyamoto et al. and Frankel et al. as an engineering design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an arrayed waveguide grating as multiplexer/demultiplexer, as taught by Ramaswami et al., in the modified WDM transmission system of Bigo et al., Miyamoto et al. and Frankel et al. as an engineering design choice.

Note that interleaver using an interference filter is well known in the art. For example, see Gu (U.S. Patent 6,611,340 B2).

6. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al., Miyamoto et al. and Frankel et al. as applied to claims 3-12 above, and further in view of Koshi (U.S. Patent Application Pub. 2002/0025111 A1).

Bigo et al., Miyamoto et al. and Frankel et al. have been discussed above in regard to claims 3-12. The difference between Bigo et al., Miyamoto et al. and Frankel et al. and the claimed invention is that Bigo et al., Miyamoto et al. and Frankel et al. do not teach dielectric multi-layer film filter. Koshi teaches in FIG. 2 a wavelength multiplexer 2. Koshi teaches in paragraph [0099] that Mach-Zehnder interferometer type wavelength multiplexer, arrayed waveguide grating or dielectric multi-layer filter can be used for multiplexer 2. One of ordinary skill in the art would have been motivated to combine the teaching of Koshi with the modified WDM transmission system of Bigo et al., Miyamoto et al. and Frankel et al. as an engineering

design choice. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a dielectric multi-layer film filter as multiplexer/demultiplexer, as taught by Koshi, in the modified WDM transmission system of Bigo et al., Miyamoto et al. and Frankel et al. as an engineering design choice.

7. Claims 16 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. and Miyamoto et al. as applied to claims 1 and 17 above, and further in view of Guy (U.S. Patent 6,690,886 B 1).

Bigo et al. and Miyamoto et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al, and Miyamoto et al. and the claimed invention is that Bigo et al. and Miyamoto et al. do not teach calculating spectrum efficiency at which a performance index is maximized. However, Guy teaches in col. 3, lines 39-48 and col. 6, lines 25-35 that spectrum efficiency is a compromise between channel spacing and degradation of signal quality caused by effects such as crosstalk. Therefore, it is obvious for one of ordinary skill in the art to minimize degradation and channel spacing, i.e., maximizing (B/S) and $1/\Delta Q$.

Regarding claim 25, instant specification admits on page 12, first paragraph that when the performance index is maximized, the product of a transmission distance and a transmission capacity is also maximized.

8. Claims 18, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bigo et al. and Miyamoto et al. as applied to claims 1 and 17 above, and further in view of Silberberg et al. (U.S. Patent 7,035,484 B2).

Bigo et al. and Miyamoto et al. have been discussed above in regard to claims 1 and 17. The difference between Bigo et al. and Miyamoto et al. and the claimed invention is that Bigo et

al. and Miyamoto et al. do not teach polarization independent filter. Silberberg et al. teaches in col. 14, lines 9-12 and col. 15 lines 43-54 to make filter polarization independent for applications that do not use any particular polarization arrangement because polarization is random if there lacks any polarization control. One of ordinary skill in the art would have been motivated to combine the teaching of Silberberg et al. with the modified WDM transmission system of Bigo et al. and Miyamoto et al. because using polarization independent filters does not require any particular polarization control. Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use polarization independent filters, as taught by Silberberg et al., in the modified WDM transmission system of Bigo et al. and Miyamoto et al. because using polarization independent filters does not require any particular polarization control.

Response to Arguments

9. Applicant's arguments filed 8 May 2008 have been fully considered but they are not persuasive.

The Applicant argues that Bigo teaches away from the "signal light is determined to be an NRZ modulation type" and the filtered signal lights "having respective bit rates and frequency spacing to approach a spectrum efficiency maximizing a product of a transmission distance and a transmission capacity of the system". The Examiner disagrees. Bigo teaches on page 363 first col., first paragraph to use 0.6 nm filter for NRZ and 0.65 nm for RZ format. That is, using NRZ gives better spectrum efficiency.

The Applicant argues "It would not have been obvious to one skilled in the art at the time the invention was made to combine Bigo with Miyamoto et al. because Bigo uses a polarization

demultiplexer consisting of a polarization controller and a polarizer in an attempt to achieve the spectrum efficiency. Orthogonal polarization transmission assemblies and polarization division multiplexing transmission assemblies become very complicated as the number of parts in an optical sender and receiver increase. Therefore, size and costs increase." However, the Examiner does not suggest combining the references in the way argued by the Applicant. The Examiner simply suggests using the super-Gaussian filters, as taught by Miyamoto et al. in the transmission system of Bigo et al.

The Applicant argues that Guy does not teach or suggest "optimizing a transmission characteristic corresponding to each light signal by superimposing a gaussian filter centered on a frequency of each light signal, which narrows a bandwidth of the light signal before multiplexing the light signals, wherein the type of modulation of said signal light is determined to be an NRZ modulation type." However, Guy teaches in col. 3, lines 39-48 and col. 6, lines 25-35 that spectrum efficiency is a compromise between channel spacing and degradation of signal quality caused by effects such as crosstalk. Optimization involves only routine skill in the art and is obvious. In re Aller, 105 USPQ 233.

The Applicant argues "It is respectfully submitted that it would not have been obvious to one of ordinary skill in the art at the time the invention was made to use a polarization filter instead of the Gaussian filter of Miyamoto in the system of Bigo that requires a polarization controller. Accordingly, claim 18 patentably distinguishes over the cited art." In response to applicant's argument, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the

test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shi K. Li whose telephone number is 571 272-3031. The examiner can normally be reached on Monday-Friday (7:30 a.m. - 4:30 p.m.).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

skl
5 August 2008

/Shi K. Li/
Primary Examiner, Art Unit 2613